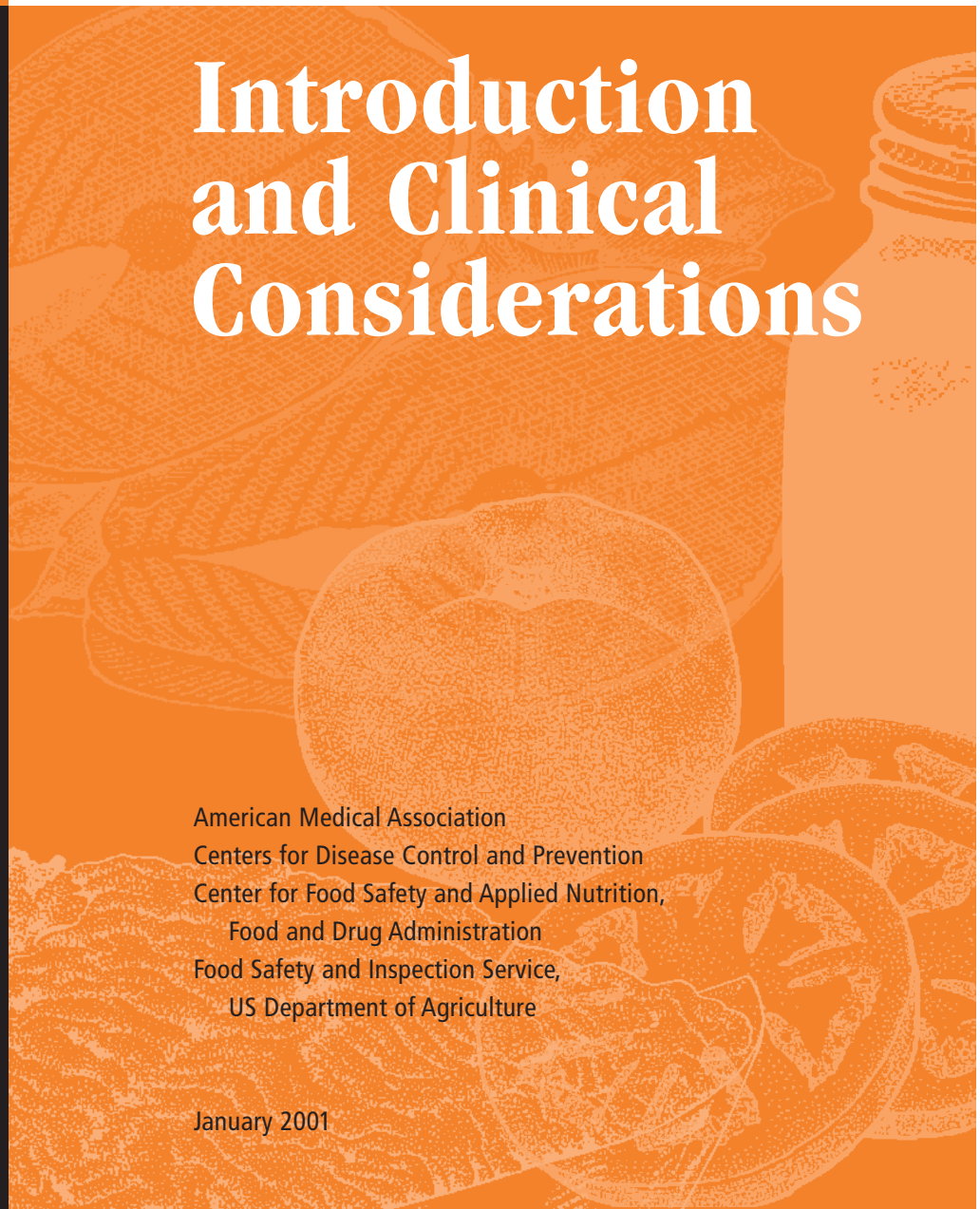
Diagnosis and Management of Foodborne Illnesses

A Primer for Physicians

Introduction and Clinical Considerations



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Primer Contents

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CDC designates this educational activity for a maximum of 3 hours in category 1 credit towards the AMA Physician's Recognition Award. Each physician should claim only those hours of credit that he/she actually spent in the educational activity.

Preface

Foodborne illness is a serious public health problem. The Centers for Disease Control and Prevention (CDC) estimates that each year 76 million people get sick, more than 300,000 are hospitalized, and 5,000 Americans die as a result of foodborne illnesses, primarily the very young, elderly, and the immunocompromised. Recent changes in human demographics and food preferences, changes in food production and distribution systems, microbial adaptation, and lack of support for public health resources and infrastructure have led to the emergence of novel as well as traditional foodborne diseases. With increasing travel and trade opportunities, it is not surprising that the risk of contracting and spreading a foodborne illness now exists locally, regionally, and even globally.

Physicians have a critical role in the prevention and control of food-related disease outbreaks. This primer is intended to help physicians in this role by providing them with practical and concise information on the diagnosis, treatment, and reporting of foodborne illnesses. It was developed collaboratively by the American Medical Association, the Centers for Disease Control and Prevention, the Food and Drug Administration's Center for Food Safety and Applied Nutrition, and the US Department of Agriculture's Food Safety and Inspection Service as part of President Clinton's National Food Safety Initiative.

We encourage you to review this information and participate in the attached continuing medical education (CME) program. Even if you choose not to participate in the CME component, please take time to complete and return the "Program Evaluation Form." Your feedback is valuable for updating this primer and for planning future physician education programs

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Background

This primer is directed to primary care physicians, who are more likely to see the index case of a potential food-related disease outbreak. It is a teaching tool to update primary care physicians about foodborne illness and remind them of their important role in recognizing suspicious symptoms, disease clusters, and etiologic agents, and reporting cases of foodborne illness to public health authorities.

Specifically, this guide urges physicians to:

- Recognize the potential for a foodborne etiology in a patient's illness;
- Realize that many but not all cases of foodborne illness have gastrointestinal tract symptoms;
- Obtain stool cultures in appropriate settings, and recognize that testing for some specific pathogens, eg, *E. coli* O157:H7, *Vibrio* spp., must be requested;
- Report suspect cases to appropriate public health officials;
- Talk with patients about ways to prevent food-related diseases; and
- Appreciate that any patient with foodborne illness may represent the sentinel case of a more widespread outbreak.

Foodborne illness is considered to be any illness that is related to food ingestion; gastrointestinal tract symptoms are the most common clinical manifestations of foodborne illnesses. This document provides detailed summary tables and charts, references, and resources for healthcare professionals. Patient scenarios and clinical vignettes are included for self-evaluation and to reinforce information presented in this primer. Also included is a CME component worth 3 credit hours.

This primer is not a clinical guideline or definitive resource for the diagnosis and treatment of foodborne illness. Safe food handling practices and technologies (eg, irradiation, food processing and storage) also are not addressed. More detailed information on these topics is available in the references and resources listed in this document, as well as from medical specialists and medical specialty societies, state and local public health authorities, and federal government agencies.

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The American Medical Association
http://www.ama-assn.org/foodborne

The Centers for Disease Control and Prevention
http://www.cdc.gov

Center for Food Safety and Applied Nutrition,
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http://www.fda.gov/cfsan

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Clinical Considerations

Food-related disease threats are numerous and varied, involving biological and nonbiological agents. Foodborne illnesses can be caused by microorganisms and their toxins, marine organisms and their toxins, fungi and their related toxins, and chemical contaminants. During the last 20 years, some foods that have been linked to outbreaks include: milk (*Campylobacter*); shellfish (Norwalk-like viruses); unpasteurized apple cider (*Escherichia coli* O157:H7), eggs (*Salmonella*); fish (ciguatera poisoning); raspberries (*Cyclospora*); strawberries (hepatitis A virus); and ready-to-eat meats (*Listeria*).

While physicians have a critical role in surveillance for and prevention of potential disease outbreaks, only a fraction of the people who experience gastrointestinal tract symptoms from foodborne illness seek medical care. In those who do seek care and submit specimens, bacteria are more likely than other pathogens to be identified as causative agents. Bacterial agents most often identified in patients with foodborne illness in the United States are *Campylobacter, Salmonella,* and *Shigella* species, with substantial variation occurring by geographic area and season. Testing for viral etiologies of diarrheal disease is rarely done, but viruses are considered the most common cause of foodborne illness.

This section and the **Foodborne Illnesses Tables** summarize diagnostic features and laboratory testing for bacterial, viral, parasitic, and noninfectious causes of foodborne illness. For more specific guidance, consult an appropriate medical specialist or medical specialty society, as well as various resources listed in other sections of this document. Also refer to this section and the **Foodborne Illnesses Tables** when working through the **Patient Scenarios** and **Clinical Vignettes** of this primer.

Recognizing Foodborne Illnesses

Patients with foodborne illnesses typically present with gastrointestinal tract symptoms (eg, vomiting, diarrhea, and abdominal pain); however, nonspecific symptoms and neurologic symptoms may also occur. Every outbreak begins with an index case who may not be severely ill. A physician who encounters this person may be the only one with the opportunity to make an early and expeditious diagnosis. Thus, the physician must have a high index of suspicion and ask appropriate questions to recognize that an illness may have a foodborne etiology.

Important clues to determining the etiology of a foodborne disease are the:

- Incubation period;
- Duration of the resultant illness;
- Predominant clinical symptoms; and
- Population involved in the outbreak.

Additional clues may be derived by asking whether the patient has consumed raw or poorly cooked foods (eg, raw or undercooked eggs, meats, shellfish, fish), unpasteurized milk or juices, home canned goods, fresh produce, or soft cheeses made from unpasteurized milk. Inquire whether any of the patient's family members or close friends has similar symptoms. Inquiries about living on or visiting a farm, pet contact, day care attendance, occupation, foreign travel, travel to coastal areas, camping excursions to mountains or other areas where untreated water is consumed, and attendance at group picnics or similar outings also may provide clues for determining the etiology of the illness.

If a foodborne illness is suspected, submit appropriate specimens for laboratory testing and contact the state or local health department for advice about epidemiologic investigation. For the physician, implication of a specific source in disease transmission is difficult from a single patient encounter. Attempts to identify the source of the outbreak are best left to public health authorities.

Because infectious diarrhea can be contagious and is easily spread, rapid and definitive identification of an etiologic agent may help control a disease outbreak. An individual physician who obtains testing can contribute the necessary piece of data that ultimately leads to identification of the source of an outbreak.

Diagnosing Foodborne Illnesses

Differential Diagnosis

As shown in Table 1 and the **Foodborne Illnesses Tables** a variety of infectious and noninfectious agents must be considered in patients suspected of having a foodborne illness. Establishing a diagnosis can be difficult, however, particularly in patients with persistent or chronic diarrhea, those with severe abdominal pain, and when there is an underlying disease process. The extent of diagnostic evaluation depends on the clinical picture, the differential diagnosis considered, and clinical judgment.

If any of the following signs and symptoms occur, alone or in combination, laboratory testing may provide important diagnostic clues (particular attention should be given to very young and elderly patients and to immunocompromised patients, all of whom are more vulnerable):

- Bloody diarrhea
- Weight loss
- Diarrhea leading to dehydration
- Fever
- Prolonged diarrhea (3 or more unformed stools per day, persisting several days)
- Neurologic involvement such as paresthesias, motor weakness, cranial nerve palsies
- Sudden onset of nausea, vomiting, diarrhea
- Severe abdominal pain

In addition to foodborne causes, a differential diagnosis of gastrointestinal tract disease should include underlying medical conditions such as irritable bowel syndrome; inflammatory bowel diseases such as Crohn's disease or ulcerative colitis; malignancy; medication use (including antibiotic-related *Clostridium difficile* toxin colitis); gastrointestinal tract surgery or radiation; malabsorption syndromes; immune deficiencies; Brainerd diarrhea; and numerous other structural, functional, and metabolic etiologies. Consideration also should be given to exogenous factors such as the association of the illness with travel, occupation, emotional stress, sexual practices, exposure to other ill persons, recent hospitalization, child care center attendance, and nursing home residence.

The differential diagnosis of patients presenting with neurological symptoms due to a foodborne illness is also complex. Possible food-related causes to consider include recent ingestion of contaminated seafood, mushroom poisoning, and chemical poisoning. Because the ingestion of certain toxins (eg, botulinum toxin, tetrodotoxin) and chemicals (eg, organophosphates) can be life-threatening, a differential diagnosis must be made quickly with concern for aggressive therapy and life support measures (eg, respiratory support, administration of antitoxin or atropine), and possible hospital admission.

Clinical Microbiology Testing

When submitting specimens for microbiologic testing, it is important to realize that clinical microbiology laboratories differ in protocols used for the detection of pathogens. To optimize recovery of an etiologic agent, physicians should understand routine specimen collection and testing procedures as well as circumstances and procedures for making special test requests. Some complex tests (eg, toxin testing, serotyping, molecular techniques) may only be available from large commercial and public health laboratories. Contact your microbiology laboratory for more information.

Stool cultures are indicated if the patient is immunocompromised, febrile, has bloody diarrhea, has severe abdominal pain, or if the illness is clinically severe or persistent. Stool cultures are also indicated if many fecal leukocytes are present, which indicates diffuse colonic inflammation and is suggestive of invasive bacterial pathogens such as *Shigella, Salmonella,* and *Campylobacter* species, and invasive *E. coli*. In most laboratories, routine stool cultures are limited to screening for *Salmonella* and *Shigella* species, and *Campylobacter jejuni/coli*. Cultures for *Vibrio* and *Yersinia* species, *E. coli* O157:H7, and *Campylobacter* species other than *jejuni/coli* require additional media or incubation conditions and therefore require advance notification or communication with laboratory and infectious disease personnel.

Stool examination for parasites generally is indicated for patients with suggestive travel histories, who are immunocompromised, who suffer chronic or persistent diarrhea, or when the diarrheal illness is unresponsive to appropriate antimicrobial therapy. Stool examination for parasites is also indicated for gastrointestinal tract illnesses that appear to have a long incubation period. Requests for ova and parasite examination of a stool specimen will often enable identification of *Giardia lamblia* and *Entamoeba histolytica,* but a special request may be needed for detection of *Cryptosporidium parvum* and *Cyclospora cayetanensis*. Each laboratory may vary in its routine procedures for detecting parasites so it is important to contact your laboratory.

Blood cultures should be obtained when bacteremia or systemic infection are suspected.

Direct antigen detection tests and molecular biology techniques are available for rapid identification of certain bacterial, viral, and parasitic agents in clinical specimens. In some circumstances, microbiologic and chemical laboratory testing of vomitus or implicated food items also is warranted. For more information on laboratory procedures for the detection of foodborne pathogens, consult an appropriate medical specialist, clinical microbiologist, or state public health laboratory.

Treating Foodborne Illnesses

Selection of appropriate treatment depends on identification of the responsible pathogen (if possible) and determining if specific therapy is available. Many episodes of acute gastroenteritis are self limiting and require fluid replacement and supportive care. Oral rehydration is indicated for patients who are mildly to moderately dehydrated; intravenous therapy may be required for more severe dehydration. Because many antidiarrheal agents have potentially serious adverse effects in infants and young children, their routine use is not recommended in this age group.

Choice of antimicrobial therapy should be based on:

- Clinical signs and symptoms;
- Organism detected in clinical specimens;
- Antimicrobial susceptibility tests; and
- Appropriateness of treating with an antibiotic (some enteric bacterial infections are best not treated).

Knowledge of the infectious agent and its antimicrobial susceptibility pattern allows the physician to initiate, change, or discontinue antimicrobial therapy. Such information also can support public health surveillance of infectious disease and antimicrobial resistance trends in the community. Antimicrobial resistance has increased for some enteric pathogens, which requires judicious use of this therapy.

Table 1. Etiologic Agents to Consider for Various Manifestations of Foodborne Illnesses

Clinical Presentation	Potential Food-Related Agents to Consider
Gastroenteritis (vomiting as primary symptom; diarrhea also may be present)	Viral gastroenteritis, most commonly rotavirus in an infant or Norwalk-like virus in an older child or adult; or food poisoning due to preformed toxins (eg, vomitoxin, *Staphylococcus aureus* toxin, *Bacillus cereus* toxin) and heavy metals.
Noninflammatory diarrhea (acute watery diarrhea without fever/dysentery; some cases may present with fever)[1]	Can be caused by virtually all enteric pathogens (bacterial, viral, parasitic) but is a classic symptom of: Enterotoxigenic *E. coli* *Vibrio cholerae* Enteric viruses (astroviruses, caliciviruses, enteric adenovirus, rotavirus) *Cryptosporidium parvum* *Cyclospora cayetanensis*
Inflammatory diarrhea (invasive gastroenteritis; grossly bloody stool and fever may be present)[2]	*Shigella* species *Campylobacter* species *Salmonella* species Enteroinvasive *E. coli* Enterohemorrhagic *E. coli* *Vibrio parahemolyticus* *Entamoeba histolytica* *Yersinia enterocolitica*
Persistent diarrhea (lasting ≥14 days)	Prolonged illness should prompt examination for parasites, particularly in travelers to mountainous or other areas where untreated water is consumed. Consider *Cyclospora cayetanensis, Cryptosporidium parvum, Entamoeba histolytica,* and *Giardia lamblia.*
Neurologic manifestations (eg, paresthesias, respiratory depression, bronchospasm)	Botulism (*Clostridium botulinum* toxin) Organophosphate pesticides Thallium poisoning Scombroid fish poisoning (histamine, saurine) Ciguatera fish poisoning (ciguatoxin) Tetrodon fish poisoning (tetrodotoxin) Neurotoxic shellfish poisoning (brevitoxin) Paralytic shellfish poisoning (saxitoxin) Amnesic shellfish poisoning (domoic acid) Mushroom poisoning Guillain-Barré Syndrome (associated with infectious diarrhea due to *C. jejuni*)
Systemic illness	*Listeria monocytogenes* *Brucella species* *Trichinella spiralis* *Toxoplasma gondii* *Vibrio vulnificus* Hepatitis A virus

1 Noninflammatory diarrhea is characterized by mucosal hypersecretion or decreased absorption without mucosal destruction and generally involves the small intestine. Some affected patients may be dehydrated because of severe watery diarrhea and may appear seriously ill. This is more common in the young and the elderly. Most patients experience minimal dehydration and appear mildly ill with scant physical findings. Illness typically occurs with abrupt onset and brief duration. Fever and systemic symptoms usually are absent (except for symptoms related directly to intestinal fluid loss).

2 Inflammatory diarrhea is characterized by mucosal invasion with resulting inflammation and is caused by invasive or cytotoxigenic microbial pathogens. The diarrheal illness usually involves the large intestine and may be associated with fever, abdominal pain and tenderness, headache, nausea, vomiting, malaise, and myalgia. Stools may be bloody and may contain many fecal leukocytes.

Surveillance and Reporting of Foodborne Illnesses

Reporting of foodborne illnesses in the United States began more than 50 years ago when state health officers, concerned about the high morbidity and mortality caused by typhoid fever and infantile diarrhea, recommended that cases of "enteric fever" be investigated and reported. The intent of investigating and reporting these cases was to obtain information about the role of food, milk, and water in outbreaks of gastrointestinal tract illness as the basis for public health actions. These early reporting efforts led to the enactment of important public health measures (eg, the Pasteurized Milk Ordinance) that profoundly decreased the incidence of foodborne illnesses.

Often health care professionals may suspect foodborne illness either because of the organism involved or because of other available information, such as several ill patients who have eaten the same food. Health care professionals can serve as the eyes and ears for the health department by providing such information to the local or state public health authorities. Foodborne disease reporting is not only important for disease prevention and control, but more accurate assessments of the burden of foodborne illness in the community occur when physicians report foodborne illnesses to the local or state health department. In addition, reporting of cases of foodborne illness by practicing physicians to the local health department may help the health officer identify a foodborne disease outbreak in the community. This may lead to early identification and removal of contaminated products from the commercial market. If a restaurant or other food service establishment is identified as the source of the outbreak, health officers will work to correct inadequate food preparation practices, if necessary. If the home is the likely source of the contamination, health officers can institute public education about proper food handling practices. Occasionally, reporting may lead to the identification of a previously unrecognized agent of foodborne illness. Reporting also may lead to identification and appropriate management of human carriers of known foodborne pathogens, especially those with high-risk occupations for disease transmission such as foodworkers.

Table 2 lists current reporting requirements for foodborne diseases and conditions in the United States. National reporting requirements are determined collaboratively by the Council of State and Territorial Epidemiologists and the Centers for Disease Control and Prevention (CDC).

Typically, the appropriate procedure for physicians to follow in reporting foodborne illnesses is to contact the local or state health department whenever they identify a specific notifiable disease. However, it is often unclear if a patient has a foodborne illness prior to diagnostic tests, so physicians should also report potential foodborne illnesses, such as when two or more patients present with a similar illness that may have resulted from the ingestion of a common food. Local health departments then report the illnesses to the state health department and determine if further investigation is warranted.

Each state health department reports foodborne illnesses to the CDC. The CDC compiles this data nationally and disseminates information to the public through annual summary reports. The CDC assists state and local public health authorities with epidemiologic investigations and the design of interventions to prevent and control food-related outbreaks. The CDC also coordinates a national network of public health laboratories, called PulseNet, which perform "molecular fingerprinting" of bacteria (by pulsed-field gel electrophoresis) to support epidemiolgic investigations.

Thus, in addition to reporting cases of potential foodborne illnesses, it is important for physicians to report noticeable increases in unusual illnesses, symptom complexes, or disease patterns (even without definitive diagnosis) to public health authorities. Prompt reporting of unusual patterns of diarrheal/gastrointestinal tract illness, for example, can allow public health officials to initiate an epidemiologic investigation earlier than would be possible if the report awaited definitive etiologic diagnosis.

Table 2. Foodborne Diseases and Conditions Designated as Notifiable at the National Level, United States 2000

Notifiable Bacterial Foodborne Diseases and Conditions Botulism Brucellosis Cholera *Escherichia coli* O157:H7 Hemolytic uremic syndrome, post-diarrheal Salmonellosis Shigellosis Typhoid fever
Notifiable Viral Foodborne Diseases and Conditions Hepatitis A
Notifiable Parasitic Foodborne Diseases and Conditions Cryptosporidiosis Cyclosporiasis Trichinosis
In the United States, additional reporting requirements may be mandated by state and territorial laws and regulations. Details on specific state reporting requirements are available from the: **Council of State and Territorial Epidemiologists** (telephone: 770 458-3811). Information is available electronically at http://www.cste.org/reporting%20requirements.htm. **Centers for Disease Control and Prevention** *Morbidity and Mortality Weekly Report* [1999;48(21):447-448]. This information is available electronically at http://www.cdc.gov/epo/mmwr/preview/mmwrhtml/mm4821a4.htm.

Finally, new information on food safety is constantly emerging. Recommendations and precautions for people at high risk are updated whenever new data about preventing foodborne illnesses become available. Physicians and other health care professionals need to be aware of and follow the most current information on food safety.